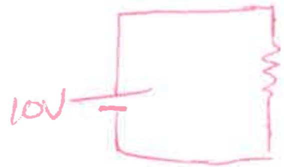
1.9

$V = IR$ $\qquad$ $R_V = 10 \times 10^6\ \Omega$

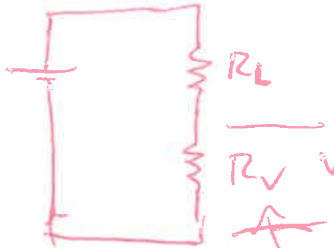


$V = IR$

$10V = I_L R_L$

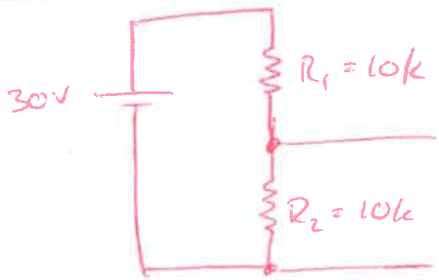
$I_L = \dfrac{10V}{1000 \times 10^6} \simeq 0$

because Leak resistor is much bigger than voltmeter resistor, attaching in series doesn't noticeably decrease current



$V_V = I_L R_V = \dfrac{10V \ \ 10 \times 10^6}{1000 \times 10^6} = 0.1\ V$

1.10



a) No load

$$V_{out} = \frac{R_2}{R_1 + R_2} V_{in}$$

b) R_{Load} $\quad$ ($R_2 + R_{Load}$ Parallel) $= R_e = \dfrac{R_2 R_L}{R_2 + R_L}$

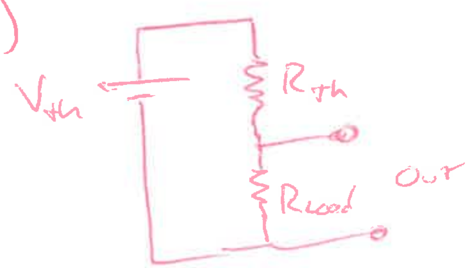
so new voltage divider

$$V_{out} = \frac{R_e}{R_1 + R_e} V_{in} = \frac{\frac{R_2 R_L}{R_2 + R_L} V_{in}}{R_1 + \frac{R_2 R_L}{R_2 + R_L}} = \frac{\frac{R_2 R_L}{\cancel{R_2 + R_L}} V_{in}}{\frac{R_1 R_2 + R_1 R_L + R_2 R_L}{\cancel{R_2 + R_L}}}$$

c) Thevenin $\quad V_{th} = \dfrac{R_2}{R_1 + R_2} V_{in} \qquad R_{th} = \dfrac{R_1 R_2}{R_1 + R_2}$

$I = \dfrac{V}{R}$

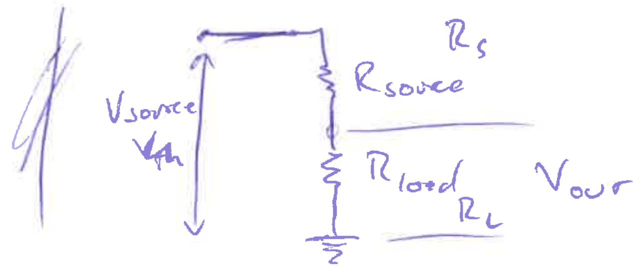
d)



$$V_{out} = \frac{V_{th}}{R_{th} + R_{Load}} = \frac{\frac{R_2}{R_1 + R_2} V_{in}}{\frac{R_1 R_2}{R_1 + R_2} + R_L} = \frac{\frac{R_2}{\cancel{R_1 + R_2}} V_{in}}{\frac{R_1 R_2 + R_1 R_L + R_2 R_L}{\cancel{R_1 + R_2}}}$$

Problem 1.11

$P = IV$



$$P = IV = \frac{V^2}{R} \qquad \frac{V_{out}^2}{R_{load}\,(R_L)} \qquad V_{out} = \frac{R_{load}\ (R_L)}{R_{source} + R_L \quad \cancel{R_L\ R_s} \quad R_s + R_L}$$

$$P = \frac{R_L^{\cancel{2}}}{(R_s + R_L)^2\,\cancel{R_L}} = \frac{R_L}{(R_s + R_L)^2}$$

$$\frac{dP}{dR_L} = \frac{1}{\cancel{(R_s + R_L)^2}} + \frac{R_L(-2)}{(R_s + R_L)^{\cancel{3}}} = 0$$

$$1 - \frac{2R_L}{R_s + R_L} = 0$$

$$1 = \frac{2R_L}{R_s + R_L}$$

$$R_s + R_L = 2R_L$$

$$\boxed{R_s = R_L}$$